SHADING IN AUGMENTED REALITY APPLICATIONS

NAME: KOH JUN KANG

SUPERVISOR: ASSOC. PROF. DR. ABDULLAH BADE

PROGRAM: MATHEMATICS WITH COMPUTER GRAPHICS

ABSTRACT

Augmented Reality application has been widely used in the field of surgical, military and gaming. In order to make the object look realistic, correct physical plausible manners rendering is very important if need to interact with the real world object. False physical rendering will easily occur if we directly render virtual objects using the virtual light since a human cannot estimate the light source position in the real world. This Augmented Reality application was developed to allow the user to render and superimpose realistic virtual object into the real world which satisfies the condition that the light source is remaining static in one position in the real world. To solve this problem, an Augmented Reality application that integrates light source tracking method (median cut light probe sampling) with the standard shading algorithm (Flat Shading, Gouraud Shading, and Phong Shading) is developed. The project framework is categorized into two phases which include the research phase and development phase. Several light source tracking methods and standard shading algorithm are studied and used as a guide to developing the Augmented Reality application prototype. The proposed Augmented Reality application is separate from image processing and Augmented Reality rendering part. The image processing part deal with the light source tracking for initial light source position estimation while Augmented Reality rendering part deal with the virtual object rendering, shading, and lighting. Several experiments were conducted to test the accuracy and efficiency of the Augmented Reality application prototype which initial light position test and the Central Processing Unit, Graphic Processing Unit (GPU) and memory usage test. From the test conducted, the accuracy to place the virtual light in the right position is up to 85%. The Augmented Reality application prototype uses the average of 25% of the Central Processing Unit. The GPU test result for the Flat shading, Gouraud Shading and Phong Shading are 0.8% - 2.9%, 1.6% - 3.6% and 1.0% - 2.7% respectively. The memory usage of the laptop for whole processes is 188.3MB but will increase while the virtual image is rendered. For the experiment conducted, the light tracking techniques used can well estimate the initial position of the lighting from a standardised picture and this technique can well integrate with the augmented reality application to produce a satisfactory shading effect.